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AUTHOR Caster, Tonja
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ABSTRACT

Practical issues that should be considered in placing a classroom computer for use with elementary students include where to locate computer equipment in relation to electrical sockets, windows, and chalkboards; the program sound; who will be able to see the screen; and classroom traffic patterns. Decisions must be made regarding the size of groups that will work at the computer, who will use the computer, and the use schedule. Computers can be integrated into the curriculum as reinforcement with drill and practice programs; as a tutor; for enrichment using simulations; and for word processing. Examples of elementary programs include Stickybear ABC, the Story Machine, Keyboard, and Master Type. In nearly all of six cited research studies on computer assisted instruction (CAI) in language arts teaching, CAI was found to be more effective than traditional methods for teaching reading, vocabulary, and language; findings for the effectiveness of CAI in writing instruction were mixed. This report includes a list of 10 criteria for evaluating computerized reading programs, a summary of important questions to consider in using computers, and a 7-item reference list. (LMM)

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The Use and Effectiveness of Computers in the Elementary Classroom

Tonja Caster

University of Georgia

Georgia Association for Childhood Education International

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The Use and Effectiveness of Computers

in the Elementary Classroom

The scene: During the Tuesday afternoon faculty meeting, the principal announces that he expects to see students using the newly purchased microcomputers when he visits your classroom next Monday. A computer has been in your classroom--unused--for three weeks now. You did hear Dr. Computerese give a three-hour presentation about the mechanics of using microcomputers during the teacher workday a month ago, but he did not discuss how to integrate the use of the computer into your classroom routine. You leave the meeting with an early dread of the coming Monday.

If this happened to you, would you know what to do? If you would not, you are not alone. Computers are being placed in many elementary classrooms where the teachers have not been prepared to use them.

For the next few minutes I am going to discuss practical issues you should consider in placing the computer in your classrooms and in using the computer with your elementary students. I will suggest some ways of integrating the use of the computer into your already existing curriculum. Finally, I will present some of the research findings about how the use of the computer in language arts affects achievement. Perhaps this will make you more comfortable.

You know how to turn the microcomputer on and off, how to run a program, to exit a program, and how to copy a program disk or tape. But do you know where to put this equipment in your classroom? If you have taught, you have answered a similar

question many times. Locating a place for a computer is not unlike those problems your have solved with other pieces of equipment, but the additional issues you need to consider stem from the characteristics of the computer. First, where are the electrical sockets in your room? For safety reasons you will not want electrical cords placed where they may be tripped over. You can avoid this by placing the computer near electrical sockets. Second, where are the windows in your room? Because of glare you will not want the computer to face toward or away from windows. You can avoid this by placing the computer at a right angle to the windows. Third, where are the chalkboards in your room? Since chalkdust can impair the functioning of computers and disks, you will want to put the computer as far away from the chalkboards as possible. Fourth, if any of the programs you use employ sound, will you choose to have the students use it? (That is, if you have a choice. Some programs have sound, but you cannot turn it off. So you either listen to the sounds or you do not use that particular program. The sound on some programs is diagnostic. That is, it tells the listener the accuracy of the answers being given.) If you are going to use the sound contained on programs, will you want to place the computer where the sound will not interfere with other activities or where you can hear the sound? Fifth, do you want to place the computer where you (and everyone) can see the screen or where no one can see it? Some teachers prefer to be able to see the screen so that they can monitor the student(s)' progress, but some want it turned away so that it will not distract students who are not using it. Finally, you will want to consider the traffic

patterns in your classroom and to decide whether or not you want students who are not using the computer to be able to access the computer easily.

You now have placed the computer in your classroom. How do you use it with your students? There are several things to decide at this point.

First, what size of group will work at the computer? In deciding this it might help to consider the programs you are using with your students. Sometimes the documentation that accompanies the programs will suggest group size. If the program does not give suggestions, you may want to experiment with the size of groups to determine which works best for your situation. Here are several alternatives: (1) paired practice, where two students test and time each other, (2) paired work, where one student watches the screen and tells what is to be typed and the other does the typing, (3) tutorial group, where one student serves as the other's tutor, (4) individual work, with students taking turns, and (5) turn taking, where two students are at the computer at the same time; one works while the other watches; the one who watches works at the computer when the other leaves, another student then comes and watches that student use the computer. With some programs and in some situations, it may be more appropriate for an individual student to work alone at the computer. Some programs, such as Snooper Troops (produced by Spinnaker Software Corporation), are appropriately used with either an individual or a small group of students.

Second, who will use the computer? You may want to use the

computer as a reward. You could allow students the privilege of using it when they have finished their work or when their work is all correct (if they are careless). You may want all of your students to use it as a center to reinforce skills that have been introduced previously. You could also use computer programs as part of a remediation program with students. Of course, this will depend greatly upon the programs you have available to use with your students.

Third, how will you schedule the use of the computer? This will depend in part on the children involved, but a timetable posted near the computer, classroom door, and/or your desk may be helpful. You could either assign each student a time every day or allow students to sign up themselves. If you allow students to sign up, you should monitor the scheduling so that the time allocations are fair and equal.

You now have the computer placed in your classroom and have decided who will use it, how turns will be determined, what the group size will be, and when it will be used. Before you allow the students to use the computer, you will want to make back-up copies of the program disks or tapes they will use and to give the students an introduction to the computer. Explain your rules, including who will use the computer, how turns will be determined, and when they will use it. Then explain and demonstrate how to turn on the computer, insert the disk or tape, load the program, remove the disk or tape, and turn off the computer. Give each student an opportunity to do each. If necessary, make a keyboard chart and help the children learn how to find and type the letters and symbols they will need to use.

You also may want to discuss any additional rules you have made for using the computer. To begin with, you may want to select a few "experts" to use as monitors/helpers until all students become proficient in the mechanics of using the computer.

In case you have not noticed, I have not covered all of the issues; many remain. The most basic is, "How can the use of the computer be implemented into my present curriculum?" First, it can be used for reinforcement. There are many drill and practice programs for providing students additional work on skills which have been previously taught in all subjects, including mathematics, reading, social studies, spelling, and grammar. A quick look at any catalog will provide many titles in these areas for most any grade level.

Second, the computer can be used for instruction as a tutor. There are also some computer assisted instruction programs which claim to teach new skills. While they may do this, you should nevertheless review them to make sure that <u>your</u> students could be taught the new skill by such a program.

Third, computers can be used for enrichment by using simulation programs. In simulations, students use previously learned concepts in situations similar to historical or present reality. Simulations can be very captivating as they are usually presented in a game-like format. There are no wrong answers, though some answers may result in undesirable consequences.

Fourth, computers can be used for word processing. Programs such as the <u>Bank Street Writer</u> (marketed by Scholastic and Broderbund Software) have been developed for many brands of

computers. Several were developed specifically for children to use. Students can use word processing programs to type original stories; teachers can use them to record language experience stories. These stories can be easily saved, edited, and printed out in multiple copies (if a printer is available).

Among my favorite programs is Stickybear ABC, produced by Xerox Education Publications and written for the Apple Computer. It is most appropriate for children between three and six years of age. After a letter is pressed, that letter appears along with a very colorful and somewhat animated picture that begins with that letter, the name of the picture, and sound or music. Some of my favorite letters are N which shows a picture of an outdoor night scene and plays, "Twinkle, Twinkle Little Star," E which shows a picture of an elephant and plays, "The Elephant Walk," and X which shows a picture of Stickybear playing a xylophone and playing the cantina music from "Star Wars."

Another of my favorite programs is The Story Machine, produced by Spinnaker Software Corporation. This program is appropriate for students who have some reading ability. To use it, students type simple sentences using any of the 67 words displayed in a vocabulary list. As the student types the words, the words and actions are graphically displayed. A fifty-word story can be composed and then "played back" if the student so desires. If the student typed, "The boy walks to the apple," first a boy then an apple would appear on the screen; finally, the boy would be shown walking over to the apple.

I have heard teachers say that using the computer would be easier for their students if their students knew where the

letters were on the keyboard. Two programs produced for the Apple can help students learn keyboard skills. Keyboard, produced by Teacher Support Software, Inc., is appropriate for elementary students. It displays a picture of the keyboard on the screen and a letter. It then highlights that letter on the keyboard. During each practice, a score is given continuously at the top of the screen. Another letter is presented after the previously displayed letter is typed. The students can choose between four programs: alphabet letters, numbers, special keys, and mixed practice. A second program which provides practice for letter location is Master Type, produced by Lightning Software. It is more difficult as it displays a letter or combinations of letters at each corner for the student to type. The letter the student types is then displayed in the center of the screen in a space ship. During each practice the number of seconds it takes for the student to finish that practice shows continuously at the top of the screen. If the student types the letters quickly, the missles aimed at the space ship explode before they reach it. If the student is too slow, a missle explodes the space ship which causes that practice to end. At the conclusion of each practice, the total number of seconds it took to complete that practice, number of letters missed, and words typed per minute are given. At that time the student can also change the speed of the practice, turn the sound on or off, and/or quit the program.

But you might say, "Why should I bother using the computer with my students? It takes away from time they could be using for other activities." First, with proper management of time the

computer can become an additional activity without subtracting time from other activities. As a classroom teacher, I found that students used their time more efficiently if there was some interesting activity planned during the day. Second, in running programs on the computer and/or using word processing programs students will become exposed to the capabilities of the computer and will learn how to operate it. It seems inevitable that some familiarity with the computer will be essential for almost everyone in the near future. Experience in using a computer will help your students become prepared for that future. There are also more immediate reasons for using the computer. Many research studies have shown that computer-assisted instruction is at least as effective as, and in some cases more effective than, traditional methods of teaching reading and writing.

I am now going to describe six studies briefly. The first four investigated the effectiveness of CAI as compared to traditional methods of teaching reading. The purpose of the last two studies was to compare the quality of students' writing using a computer with that of using paper and pencil.

Atkinson (1968 a, b) used 100 first graders from "culturally disadvantaged" homes in his study. The purpose of the study was to evaluate a computer-assisted reading program that was tutorial in nature. Instructional tasks within each lesson included decoding skills, comprehension skills, and games. Half of the students took reading lessons using CAI, while the other half were taught reading by a teacher in the classroom. Though the scores the two groups received on the fall pretest with the California Achievement Test (CAT) did not differ, the spring CAT

scores differed significantly. The CAI group scored 7.6 points higher on the vocabulary section and on the total score. Atkinson reported that the students' span of interest at the CAI terminal was more than 30 minutes.

Wilson and Fitzgibbon (1970) studied fourth- and fifth-grade students to evaluate a CAI project using drill and practice lessons. In this study, 68 students received CAI in English while a group of 77 students and a group of 42 students were instructed with traditional methods for an equal amount of time. During the four months of the study, the CAI group gained seven months while the other two groups gained three months on the standard achievement test. These differences were statistically significant. Teachers kept logs to record comments, student reactions, instruction, and student performance relating to the CAI. All comments were positive. Students enjoyed the programs; teachers enjoyed the time the programs saved them and reported better performance from students.

Lysiar and his colleagues (1976) used 2,298 students in grades three through seven to determine if computer-assisted instruction (CAI) was a more effective supplementary method of teaching than other Title I programs. After a year the results from the Reading and Vocabulary Subtests of the spring Iowa Test of Basic Skills for the CAI group were significantly higher than those for the resource teacher group for the third grade, but lower for the fourth, fifth, and sixth grades. On the Gates-MacGinitie Reading Test, the scores for the sixth- and seventh-grader CAI groups were significantly higher than for the resource

teacher groups.

Martin (cited in Brandt, 1981) developed a writing program for the computer through which children learned to write and to read. Three groups were compared. One group of first-grade students received instruction from a teacher using a standard basal reader. Another group of students received 30 minutes of the writing program plus 180 minutes of their regular basal reader program. The third group had only the writing program. At the end of the year, the students who received instruction from the teacher using the basal tested slightly above the 50th percentile, while students who received both basal instruction and the writing program tested at the 80th percentile, and those that had only the writing program tested at the 90th percentile. At the school which used only the writing program, the number of students retained in the first grade declined from 41 out of 126 to 19 out of 116.

These four studies found that CAI was generally more effective than traditional methods of teaching reading. The next two studies compared the quality of students' writing using a computer with that of using paper and pencil.

Bradley (1982) used three groups of five or six above average first-graders in her study which investigated the use of microcomputer word processors in language experience lessons. After introducing the microcomputer, the researcher typed the students' stories into the computer as the students dictated them, rather than writing them on chart paper as is usually done during language experience lessons. The stories and lessons differed from typical language experience stories and lessons

written on chart paper in the following ways: The stories ended after reaching logical conclusions, the stories were longer than the usual language experience story, students suggested changes and corrections in the stories as they told them, and the students reread the stories immediately upon receiving printed copies of them.

Woodruff and Bereiter (1981-82) used 12 sixth-grade students in their study to test a computer program designed to offer optional assistance to students writing opinion essays. The forms of assistance included editorial and spelling assistance, prompts, sentence openers, and a lists of things to include in the essays. Each student wrote on a topic using paper and pencil and on a different topic using the computer program. Results showed that using the computer took significantly more time than using paper and pencil because of the time spent using the computer's help. There were significantly more sentence openers in the papers composed using the computer than using paper and pencil. No significant differences were found between the two writing conditions for the number of words produced or for the quality of papers produced. However, students indicated that they liked writing using the computer significantly better than using paper and pencil and that it was easier to write on the computer.

Nearly all of these studies found that computer-assisted instruction was more effective than traditional methods for teaching reading, vocabulary, and language. Findings for the effectiveness of CAI in the teaching of writing were mixed. A

word of caution is necessary, however, as most of these studies used CAI programs that were available on a large mainframe computers. Though most of you elementary teachers do not have large computers available, many of you do have microcomputer CAI programs available. Since most of the research shows that CAI programs do have beneficial results on achievement, it appears that we should make every attempt to use them. However, as teachers you should select those programs that appear to be of the best educational value. I will close by handing out a list of some guidelines you should follow when selecting software programs for use in your classroom.

CRITERIA FOR EVALUATING COMPUTERIZED READING PROGRAMS
Developed by Dr. George Mason

1. As I watch children interacting with the program, do I see interest, involvement, and/or pleasure? (The best education excites those being educated--and their teachers!)

2. Is the program aimed at an educational goal that I consider desirable (or can I use it for such a goal even though the developers did not create it for such a purpose)?

3. Does the program use words, directions and/or pictures that are likely to be understandable by the students for which the program is written? (Many programs require the user to have skills not usually held by people needing the instruction offered by the program.)

4. (a) Can the program be used by a student without direct adult supervision or with the help of a peer "expert"?
(b) Can the program be easily loaded by a child or a non-expert teacher? (Some require the user to load DOS, get into BASIC, load the program, and finally to type RUN.)
(c) Is the program accident-proof? (Some programs will stop running if a student types an inappropriate response.
(d) Are the instructions presented through the computer in an interactive mode? (The program will be easier to use if it is not necessary to read the documentation (manual) to operate it.)
(e) Are the amounts of time allowed for reading instructions under the control of the student? (Some programs scroll instructions or take them off the screen too rapidly.)
(f) Is the printed text legible? (Spacing is often important, especially for younger readers. Color sometimes interferes.)
(g) Is the amount of keyboard input expected from the user too much to expect from a student who needs the program? (Few elementary children have much skill in typing.)

5. (a) How often does the computer inform the student of the correctness of his answers? (100% reinforcement may be boring in some situations.)
(b) Is the correction or computer response to a wrong answer less exciting or less fun than the response to a right answer? (Kids like excitement. Some programs actually encourage wrong answers.)

6. Are the students' scores saved for the teacher's information? (You may or may not want this option. This ability costs money and takes up space which might be used for more programs.)

7. Does the use of the program result in educational achievement (learning mastery, and/or retention)?

8. Does the program take advantage of the unique capabilities of the computer? (Sometimes it could have just as well been presented in workbook form, but the computer might be more effective than the workbook.)

9. If the program is long, can the student's responses be stored (for later retrieval and evaluation when the remainder of the program is completed)?

10. Can the program be modified by the teacher who is not a programmer? (This is an advantage to certain programs, such as vocabulary and spelling shell programs in which teachers might wish to vary the wordlists.)

Using Computers in Your Elementary Classroom:

Some Questions to Answer

by Tonja Caster

I. Where should I locate the computer?
   A. Where are the electrical sockets?
   B. Where are the windows?
   C. Where are the chalkboards?
   D. Where can I (and others) hear/not hear the sound?
   E. What are the traffic patterns?

II. How will I use it with my students?
   A. What size of group will work at the computer?
   B. Who will use the computer?
   C. How will I schedule the use of the computer?

III. How do we get ready to use the computer?
   A. Have I made back-up copies of the program disks or tapes?
   B. Have I explained my rules?
   C. Have I explained and demonstrated how to operate the computer?
   D. Have I allowed each student to practice operating the computer?
   E. Have I selected monitor/helpers who can help others operate the computer (if it is necessary).

IV. How can using the computer be implemented into my present curriculum?
   A. Reinforcement--drill and practice programs
   B. Instruction--tutorial programs
   C. Enrichment--simulation programs
   D. Composing (writing)--word processing programs

V. What are some programs?
   A. Bank Street Writer by Scholastic and Broderbund Software
   B. Stickybear ABC by Xerox Education Publications
   C. The Story Machine by Spinnaker Software Corporation
   D. Keyboard by Teacher Support Software, Inc.
   E. Master Type by Lightning Software

VI. Why should I bother using the computer with my students?
   A. Exposure to the capabilities of the computer
   B. Learning how to operate the computer
   C. Effectiveness of CAI in teaching reading and language arts
   D. Effectiveness of CAI in teaching writing

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